

PATENT**IBM Docket No. RAL920000118US1****Amendments to the Claims:**

1. (Currently amended) A search method comprising the acts of:
 - (a) using N bits, N being an integer, from a packet as an index into a data structure including a Direct Table with at least one entry and a tree structure operatively coupled to said one entry;
 - (b) setting a threshold based upon a first predetermined characteristic of the tree structure;
 - (c) using select bits from the packet to traverse said tree structure until the threshold is met;
 - (d) storing in a Contents Address Memory (CAM) at least one entry based upon a predetermined characteristic of the packet and a second predetermined characteristic of said tree structure; and
 - (e) reading the CAM; and
 - (e1) using information at the at least one entry to access a memory location whereat action to be taken relative to the packet is stored.
- 1 2. (Original) The method of Claim 1 wherein N includes the first sixteen bits of a
2 Destination MAC Address.
3. (Original) The method of claim 2 wherein the tree structure includes a plurality of nodes and leaves operatively coupled to selected nodes.
- 1 4. (Original) The method of claim 3 further including Pattern Search Control
2 Blocks (PSCBs) carrying search information positioned at selected nodes.

Serial Number 10/015165**- 4 -**

PATENT
IBM Docket No. RAL920000118US1

- 1 5. (Original) The method of Claim 1 wherein the first predetermined characteristic
2 includes nodes and the threshold is set to a count of the nodes.
- 1 6. (Original) The method of Claim 2 wherein the selected bits include the
2 remaining thirty two bits of the Destination MAC Address.
- 1 7. (Original) The method of Claim 2 wherein the second predetermined
2 characteristic includes leaves.
- 1 8. (Original) A method for correlating a search key with a database comprising
2 the acts of:
3 (a) using N bits, $N \geq 1$, from the search key as an index into the database
4 including entries having a Direct Table with at least one entry and a tree
5 structure operatively coupled to said one entry;
6 (b) setting a threshold based upon a first predetermined characteristic of the
7 tree structure;
8 (c) using M bits ($M > 1$) from the search key to access said tree structure until
9 the threshold is met; and
10 (d) reading from a CAM information that indicates action to be taken relative
11 to the search key.
- 1 9. (Original) The method of claim 8 wherein the search key includes a portion of a
2 data packet.
- 1 10. (Original) The method of claim 9 wherein the information includes the address
2 of a leaf in which the action is stored.

Serial Number **10/015165**

- 5 -

PATENT**IBM Docket No. RAL920000118US1**

1 11. (Original) The method of claim 8 wherein the reading step further includes the
2 step of using the N bits as Index into the CAM.

1 12. (Original) An apparatus comprising:
2 an embedded processor complex including a plurality of protocol
3 processors;
4 a control point processor operatively coupled to the processor complex;
5 a plurality of hardware accelerator co-processors accessible to each
6 protocol processor and providing high speed pattern searching, data
7 manipulation and frame parsing;
8 at least one memory device, operatively coupled to the processor
9 complex, that stores data structures including a Direct Table, nodes and leaves
10 operatively chained together; and
11 a Memory location operatively coupled to the processor complex and
12 storing a value representative of the maximum number of nodes to be accessed
13 during a tree search routine.

1 13. (Original) The apparatus of claim 12 further including a Contents Address
2 Memory (CAM) operatively coupled to the processor complex and storing a
3 pointer identifying a location whereat a leaf is stored.

1 14. (Original) The apparatus of claim 13 wherein the leaf contains information on
2 actions to be taken relative to a packet.

Serial Number 10/015165**- 6 -**

PATENT
IBM Docket No. RAL920000118US1

- 1 15. (Original) The apparatus of claim 14 wherein the CAM further includes an
2 indicia paired with the pointer, said indicia being selected from a portion of the
3 packet.
- 1 16. (Original) The apparatus of Claim 15 wherein the indicia includes a portion of a
2 Destination MAC Address in the packet.
- 1 17. (Currently amended) The apparatus of Claim 15 further including a circuit that
2 deletes pointers from the CAM based upon leaf ~~adjustments~~ adjustment in the
3 tree structure and/or ~~NONE use of the information within a predetermined time~~
4 ~~interval.~~
- 1 18. (Original) The apparatus of Claim 17 wherein the leaf adjustments include
2 deletion.
- 1 19. (Original) The apparatus of Claim 12 wherein the Control Point Processor is
2 programmed to generate and forward frames containing information that adjusts
3 the data structure.
- 1 20. (Currently amended) The apparatus of Claim 19 wherein the adjustment
2 includes leaf deletion and/or insertion.
- 1 21. (Original) A data structure comprising:
2 a Direct Table having at least two entries;
3 a tree structure operatively coupled to the at least two entries and having
4 a plurality of nodes and leaves operatively chained together; and

Serial Number 10/015165

- 7 -

PATENT
IBM Docket No. RA1920000118US1

5 a storage storing a threshold value indicating the maximum number of
6 nodes to be accessed during a walk of said tree structure.

1 22. (Original) The data structure of Claim 21 further including Contents Address
2 Memory, CAM, in which leaf information is stored if the leaf is connected to a
3 node above the threshold value.

1 23. (Currently amended) The data structure of Claim 22 further including a co-
2 processor responsive to at least a command to use part of the DA (Destination
3 Address) of a packet to index into the DT (Direct Table) and the remaining part
4 of said DA to search the associated tree, said co-processor selecting,
5 information stored in a leaf if the leaf is attached to a node below the threshold
6 value or selecting information stored in the CAM if the leaf is attached to a node
7 above the threshold value.

1 24. (Currently amended) A system comprising:
2 a processor to provide a key extracted from a data packet;
3 a tree walk logic responsive to use the key to walk a tree structure until a
4 threshold limiting number of nodes to traverse in said walk is reached;
5 a CAM controller to use the key to search a CAM; and
6 a controller that uses the first available result from the tree walk logic or
7 the CAM controller to determine an action to be taken relative to the data packet.

1 25. (Currently amended) A search method comprising the acts of:
2 (a) providing a key extracted from a data packet;

Serial Number 10/015165

- 8 -

PATENT**IBM Docket No. RAL920000118US1**

- 3 (b) using said key by a tree walk logic to search a tree structure until a
4 threshold limiting number of nodes the tree walk logic traverses during a
5 tree walk is reached;
- 6 (c) using said key by a CAM controller to search a CAM; and
7 using the first result from acts (b) or (c) to determine an action to be taken
8 relative to the data packet.
26. (New) The apparatus of claim 15 further including a circuit that delete pointers from CAM based upon non-use of the information within a predefined time interval.
27. (New) The method of claim 19 wherein the adjustment includes leaf insertion.
28. (New) A method comprising:
providing a data structure configured as a tree having N nodes, $N > 1$, and M leaves, $M > 1$, operatively coupled to the N nodes;
generating with a first processor a key from a packet;
setting a threshold having a value relating to the N nodes;
providing in a CAM at least one entry with information relating to the key and information relating to the data structure;
selecting, with a second processor, bits from the key and traversing the tree based upon the bits until the threshold is met; and
reading at least one entry in the CAM to detect a location whereat action to be taken relative to the packet is stored.
29. (New) The method of claim 28 further including providing a Direct Table (DT) having at least on entry operatively coupled to said tree.

Serial Number 10/015165

- 9 -

PATENT
IBM Docket No. RAL920000118US1

- 30. (New) The method of claims 28 or 29 wherein information relating to the key including a destination address in said packet.

- 31. (New) The method of claims 28 or 29 wherein the information relating to the data structure includes an address where at least one of the N leaves is stored.

- 32. (New) The method of claim 25 wherein the tree walk and CAM search are being executed simultaneously.

- 33. (New) The data structure of claim 22 further including a pointer provided in said storage, said pointer identifying address of said CAM.

Serial Number **10/015165**

- 10 -